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### (54) **Method for driving electrographic imaging apparatus**

Verfahren zum Antreiben eines elektrophotographischen Bilderzeugungsgerätes

Procédé pour actionner un appareil de formation d'images électrophotographique

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(73) Proprietor: **Samsung Electronics Co., Ltd.**  
**Suwon-city, Kyungki-do (KR)**

(72) Inventor: **Eom, Yoon-seop**  
**Suwon-city, Kyungki-do (KR)**

(74) Representative: **Chugg, David John**  
**Appleyard Lees,**  
**15 Clare Road**  
**Halifax, West Yorkshire HX1 2HY (GB)**

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## Description

**[0001]** The present invention relates to a method for driving an electrographic imaging apparatus, and more particularly, to a method for an electrographic imaging apparatus which enables each unit apparatus to continuously operate according to the state of error without stopping the entire operation of the apparatus.

**[0002]** In a typical electrographic imaging apparatus, a photosensitive member such as a photosensitive belt is charged and the photosensitive belt is scanned by a laser according to image signals to thereby form an electrostatic latent image. The electrostatic latent image is developed by a developing apparatus using toner and the developed image is transferred by a transfer roller to print on a paper. The image is fixed on the paper by applying heat and pressure using a fixation roller.

**[0003]** During the operation of the electrographic imaging apparatus, when the paper supplied by a paper feeding apparatus is not supplied accurately, a jam sensor detects the incorrect supply of paper. The jam sensor is comprised of a timer and a sensor and detects whether the paper is supplied to a predetermined position at a predetermined time. That is, the timer operates as soon as the paper is taken out of a paper cassette and sends a time signal to a controller. Also, the sensor detects the paper passing through a predetermined point in a passage and sends a corresponding signal to the controller. Then, the controller compares the input signals with set reference signals. Here, if the paper detecting signal is not input to the controller at a set reference time, the controller generates a jam signal to stop the operation of the imaging apparatus. Concurrently, an indication of a paper jam is displayed on an external panel.

**[0004]** When a paper jam occurs as above, the entire operation of the imaging apparatus stops and there can be a possibility that the toner remaining on the photosensitive belt and the transfer roller may be fixed. Also, since the heat and pressure are continuously applied to contact portions between the fixation roller and the transfer roller, and the transfer roller and the paper, during the halted state of the apparatus, parts of the apparatus may become damaged and the life thereof may be shortened.

**[0005]** DE-A1-29 15 656 describes an electrophotographic apparatus in which the detection of a paper jam causes a transfer roller to be moved away from a photosensitive drum thus making it easier to remove jammed paper without damaging the electrophotographic apparatus, and further causes the transfer roller to move into an initial operative position.

**[0006]** With a view to solve or reduce the above problems, it is an aim of preferred embodiments of the present invention to provide a method for driving an electrographic imaging apparatus which enables each of the unit apparatuses to continuously operate according to the state of error, by not halting the entire appa-

ratus at once, when an error such as a paper jam occurs during the operation of the apparatus.

**[0007]** According to a first aspect of the invention, there is provided a method for driving an electrographic imaging unit including a photosensitive belt, a print unit having a transfer roller for transferring an image formed on the photosensitive belt to a paper and a fixation roller for fixing the image transferred to the paper, a cleaning unit for removing charges and toner remaining on the photosensitive belt, a paper pickup sensor for detecting whether the paper is normally picked up from a paper cassette feeding unit, a paper feeding sensor for detecting whether the paper is normally supplied to the print unit, and a paper output sensor for detecting whether the paper printed in the print unit is normally output therefrom, the method comprising and characterised by the steps of: (a) halting the operation of the imaging unit when an operational error occurs; (b) resuming the operation of the imaging unit when the source of the error is removed within a predetermined time; and (c) operating at least one of the photosensitive belt, the transfer roller, the fixation roller and the cleaning unit when the source of the error is not removed within the predetermined time to remove charges and toner remaining on the photosensitive belt.

**[0008]** Preferably, when said error is a paper pickup error detected by said paper pickup sensor, said step (c) comprises the sub-steps of: (c<sub>1</sub>) separating said photosensitive belt from said transfer roller; and (c<sub>2</sub>) removing charges and toner remaining on said photosensitive belt by driving said photosensitive belt and said cleaning unit.

**[0009]** The method preferably includes the step of separating said transfer roller from said fixation roller.

**[0010]** Preferably, when said error is a paper feeding error detected by said paper feeding sensor, said step (c) comprises the sub-steps of: (c<sub>1</sub>') separating said photosensitive belt from said transfer roller; and (c<sub>2</sub>') removing charges and toner remaining on said photosensitive belt by driving said photosensitive belt and said cleaning unit.

**[0011]** The method may comprise the further step of removing toner remaining on said transfer roller.

**[0012]** When said error is a paper output error detected by said paper output sensor, said step (c) preferably comprises the sub-steps of: (c<sub>1</sub>") determining whether a transfer is made from said transfer roller to said paper; (c<sub>2</sub>") waiting for an operation when the transfer is made; and (c<sub>3</sub>") separating said photosensitive belt from said transfer roller when the transfer is not made, and driving said photosensitive belt and said cleaning unit.

**[0013]** For a better understanding of the invention, and to show how embodiments of the same may be carried into effect, reference will now be made, by way of example, to the accompanying diagrammatic drawings, in which:

Figure 1 is a block diagram showing the structure

of an imaging apparatus adopting a driving method according to an embodiment the present invention;

Figure 2 is a flow chart for explaining a method for driving an imaging apparatus according to an embodiment of the present invention;

Figure 3 is a flow chart for explaining the step of controlling a paper pickup jam shown in Figure 2;

Figure 4 is a flow chart for explaining the step of controlling a paper feeding jam shown in Figure 2; and

Figure 5 is a flow chart for explaining the step of controlling a paper output jam shown in Figure 2.

**[0014]** Referring to Figure 1, in an electrographic imaging apparatus adopting a method according to an embodiment of the present invention, a photosensitive belt 104 turns in the direction indicated by the arrow, by being supported by first, second and third rollers 101, 102 and 103. Here, the rotations of the first, second and third rollers 101, 102 and 103 are controlled by a controller 116.

**[0015]** After the remaining charges and toner on the photosensitive belt 104 are removed by a cleaning unit 105, the surface of the photosensitive belt 104 is charged by a charging unit 106 to a predetermined uniform electric potential. Next, an electrostatic latent image is formed in an image forming area of the photosensitive belt 104 by emitting a laser beam according to image signals by an exposing unit 107 such as a laser scanning unit (not shown). The electrostatic latent image of the photosensitive belt 104 is developed by a developing unit 108 which supplies a liquid toner and thus a developed image is formed.

**[0016]** A paper 117 to be printed is supplied by a paper feeding unit 111 between a transfer roller 109 and a fixation roller 110. The developed image is transferred to the paper 117 via the transfer roller 109, and simultaneously, the fixation roller 110 applies heat and pressure to the paper 117 so that the transferred image can be fixed thereon.

**[0017]** According to the present invention, a motor (not shown) for driving the first, second and third rollers 101, 102 and 103 and a system driving means (not shown) are controlled by the controller 116 in order to ensure accurate printing of an image on the paper 117.

**[0018]** In step 201 of Figure 2, the moment the paper 117 is supplied by a pickup roller (not shown) from the paper feeding unit 111 (see Figure 1), a timer 112 operates and transmits a signal to the controller 116. A paper pickup sensor 113 detects whether the paper is picked up from the paper feeding unit 111 and transmits a detection signal to the controller 116. Also, a paper feeding sensor 114 installed at an inlet of a print unit 120 which includes the transfer roller 109 and the fixation roller 110

detects whether the paper is supplied to the print unit 120 and transmits a signal to the controller 116. A paper output sensor 115 installed at an output of the print unit 120 detects whether the paper is output from the print unit 120 and transmits a signal to the controller 116.

**[0019]** Then, the controller 116 compares the input detection signals with the preset reference signals, and when they are determined to be the same, the controller outputs a control signal for continuously operating the imaging unit. If the compared signals do not coincide with each other, the controller outputs a jam indication signal and an external panel (not shown) indicates a paper jam. Concurrently, each of the unit apparatuses of the imaging unit stops the operation thereof. Next, when the jam is removed within a predetermined time, the unit apparatuses of the imaging unit operate again. However, when a predetermined time passes after the jam occurs, the controller 116 operates each of the photosensitive belt 104, a cleaning unit 105, the transfer roller 109 and the fixation roller 110 according to the source of the jam occurrence regardless of whether the jam has been cleared.

**[0020]** Describing the above in detail, in step 202 of Figure 2, the controller 116 determines whether the time for detecting the paper and a preset first reference time coincide according to the signal transmitted from the paper pickup sensor 113 and the timer 112. If the compared times do not coincide with each other, the sequence proceeds to a paper pickup jam controlling step (see Figure 3). If the times coincide, it is determined whether the paper detection time by the paper feeding sensor 114 and a second preset reference time are equal, according to the signals transmitted from the paper feeding sensor 114 and the timer 112 (in step 204).

**[0021]** In step 204, when the above times do not match, the sequence proceeds to a paper feeding jam controlling step (see Figure 4). If the times coincide, it is determined whether the paper detection time by the paper output sensor 115 and a third preset reference time are equal, according to the signals transmitted from the paper output sensor 115 and the timer 112 (in step 206).

**[0022]** Also, in step 206, when the above times do not coincide, the sequence proceeds to a paper output jam controlling step (see Figure 5). If the times coincide, the timer 112 is reset as a new paper is supplied and it is determined whether a signal generated from the timer is input in step 208. When the signal is determined to be input from the timer 112 in step 208, the sequence returns to step 202. Otherwise, the sequence is terminated.

**[0023]** In Figure 3, the paper pickup jam controlling step is for a case in which a jam occurs when the paper is picked up to be supplied to the print unit 120.

**[0024]** In step 301, when the paper detection time by the paper pickup sensor 113 and the first reference time do not coincide (see step 202 of Figure 2), the controller 116 outputs the control signal for stopping the operation

of the imaging unit. In step 302, it is determined whether the source of jam occurrence is removed within a predetermined time. When the source of the jam occurrence is removed, the operation of the imaging unit is resumed, in step 303. Here, the controller 116 first confirms whether the respective unit apparatuses are synchronized and controls them to be so, and thereafter, operates the imaging unit as normal.

**[0025]** When the source of jam occurrence is not removed within a predetermined time in step 302, the photosensitive belt 104 and the transfer roller 109 are separated from each other, in step 304. Next, in step 305, the first, second and third rollers 101, 102 and 103 are driven to run the photosensitive belt 104 and simultaneously the charges and toner remaining on the photosensitive belt 104 are all removed by driving the cleaning unit 105.

**[0026]** In step 306, the transfer roller 109 and the fixation roller 110 are separated according to the signals from the controller 116 to not contaminate the fixation roller.

**[0027]** In the case that the paper pickup jam occurs during printing, it is preferable that the paper feeding unit 111 is stopped so that a further supply of paper will not be possible, and the printing of a paper already supplied continues.

**[0028]** Then, in step 307, it is determined again whether the source of the jam occurrence is removed. The determination repeats until the source is removed. If the source is removed, the sequence proceeds to step 303 so that operation of the imaging unit is resumed. Here, the controller 116 first confirms whether the respective unit apparatuses are synchronized and controls them to be so, and then, resume the operation of the imaging unit.

**[0029]** In Figure 4, the paper feeding jam controlling step is for a case in which paper is not supplied to the print unit 120 within a predetermined time. The occurrence of a jam can be detected by the paper feeding sensor 114 which detects the supplied paper.

**[0030]** In step 401, when the paper detection time by the paper feeding sensor 114 and the second reference time do not coincide (see step 204 of Figure 2), the controller 116 outputs a control signal for stopping the operation of the imaging unit. In step 402, it is determined whether the source of jam occurrence is removed within a predetermined time. When the source of the jam occurrence is removed, the operation of the imaging unit is resumed, in step 403. Here, the controller 116 first confirms whether the respective unit apparatuses are synchronized and controls them to be so, and thereafter, operates the imaging unit as normal.

**[0031]** When the source of the jam occurrence is not removed within a predetermined time in step 402, the photosensitive belt 104 and the transfer roller 109 are separated from each other, in step 404. Next, in step 405, the photosensitive belt 104 and the cleaning unit 105 are driven to remove the charges and toner remain-

ing on the photosensitive belt 104.

**[0032]** In step 406, the transfer roller 109 and the fixation roller 110 are separated from each other according to the signals from the controller 116 to not contaminate the fixation roller.

**[0033]** Next, in step 407, a blade (not shown) is operated to remove toner that is stuck to the transfer roller 109. Also, in step 408, it is determined again whether the source of the jam occurrence is removed. The determination steps are repeated until the source is removed. If the source is removed, the sequence proceeds to step 403 so that the operation of the imaging unit is resumed. Here, the controller 116 first confirms whether the respective apparatuses are synchronized and controls them to be so, and then, resumes operation of the imaging unit.

**[0034]** In Figure 5, the paper output jam controlling step is for a case in which a jam occurs while the paper is output from the print unit 120.

**[0035]** In step 501, when the paper detection time by the paper output sensor 115 and the third reference time do not coincide (see step 206 of Figure 2), the controller 116 outputs a control signal for stopping the operation of the imaging unit. In step 502, it is determined whether the source of the jam occurrence is removed within a predetermined time. When the source of jam occurrence is removed, the operation of the imaging unit is resumed, in step 503.

**[0036]** When the source of the jam occurrence is not removed within the predetermined time in step 502, it is determined whether the jam occurred after the transfer is made by the transfer roller 109, in step 504. If the transfer has made before the jam, the system waits for an operation by a user since there is no possibility of damage to the transfer roller 109, in step 505. If the jam occurs before the transfer is made in step 504, the photosensitive belt 104 and the transfer roller 109 are separated from each other, in step 506. In step 507, the photosensitive belt 104 and the cleaning unit 105 are driven to remove the charges and toner remaining on the photosensitive belt 104. In step 508, it is determined again whether the source of the jam occurrence is removed. The determination step is repeated until the source is removed. If the source is removed, the sequence proceeds to step 503 so that the operation of the imaging unit is resumed. Here, the controller 116 first confirms whether the respective apparatuses are synchronized and controls them to be so, and then, the operation of the imaging unit is resumed.

**[0037]** As described above, according to the method for driving an imaging unit according to the present invention, the respective apparatuses in the imaging unit is controlled to be driven separately according to the sources of error, so that contamination of the apparatus and fixation of toner which are generated due to an abrupt halt of the system can be prevented. Thus, the life and efficiency of operation of the imaging unit can be improved.

## Claims

1. A method for driving an electrographic imaging unit including a photosensitive belt (104), a print unit (120) having a transfer roller (109) for transferring an image formed on said photosensitive belt (104) to a paper (117) and a fixation roller (110) for fixing the image transferred to said paper (117), a cleaning unit (105) for removing charges and toner remaining on said photo sensitive belt (104), a paper pickup sensor (113) for detecting whether the paper (117) is normally picked up from a paper cassette feeding unit (111), a paper feeding sensor (114) for detecting whether the paper (117) is normally supplied to said print unit (120), and a paper output sensor (115) for detecting whether the paper (117) printed in said print unit (120) is normally output therefrom, said method comprising and **characterised** by the steps of:

(a) halting the operation of said imaging unit when an operational error occurs;

(b) resuming the operation of said imaging unit when the source of the error is removed within a predetermined time; and

(c) operating at least one of said photosensitive belt (104), said transfer roller (109), said fixation roller (110) and said cleaning unit (105) when the source of the error is not removed within the predetermined time to remove charges and toner remaining on the photosensitive belt (104).

2. The method for driving an electrographic imaging unit as claimed in claim 1, wherein, when said error is a paper pickup error detected by said paper pickup sensor (113), said step (c) comprises the sub-steps of:

(c<sub>1</sub>) separating said photosensitive belt (104) from said transfer roller (109); and

(c<sub>2</sub>) removing charges and toner remaining on said photosensitive belt (104) by driving said photosensitive belt (104) and said cleaning unit (105).

3. The method for driving an electrographic imaging unit as claimed in claim 1, wherein, when said error is a paper feeding error detected by said paper feeding sensor (114), said step (c) comprises the sub-steps of:

(c<sub>1</sub>') separating said photosensitive belt (104) from said transfer roller (109); and

(c<sub>2</sub>') removing charges and toner remaining on said photosensitive belt (104) by driving said photosensitive belt (104) and said cleaning unit (105).

4. The method for driving an electrographic imaging unit as claimed in claim 3, further comprising the step of removing toner remaining on said transfer roller (109).

5. The method for driving an electrographic imaging unit as claimed in claim 1, 2, 3 or 4, further comprising the step of separating said transfer roller (109) from said fixation roller (110).

6. The method for driving an electrographic imaging unit as claimed in claim 1, wherein, when said error is a paper output error detected by said paper output sensor (115), said step (c) comprises the sub-steps of:

(c<sub>1</sub>" ) determining whether a transfer is made from said transfer roller (109) to said paper (117);

(c<sub>2</sub>" ) waiting for an operation when the transfer is made; and

(c<sub>3</sub>" ) separating said photosensitive belt (104) from said transfer roller (109) when the transfer is not made, and driving said photosensitive belt (104) and said cleaning unit (105).

## Patentansprüche

1. Verfahren zum Steuern einer elektrophotographischen Abbildungseinheit, enthaltend ein photoempfindliches Band (104), eine Druckeinheit (120) mit einer Transferwalze (109) zum Übertragen eines auf dem photoempfindlichen Band (104) gebildeten Bildes auf ein Papier (117) und einer Fixierwalze (110) zum Fixieren des auf das Papier (117) übertragenen Bildes, eine Reinigungseinheit (105) zum Entfernen von Ladungen und Toner, die auf dem photoempfindlichen Band (104) zurückgeblieben sind, einen Papieraufnahmesensor (113) zum Erfassen, ob das Papier (117) vorschriftsmäßig von einer Papierkassettenzuführeinheit (111) aufgenommen wird, einen Papiertuführsensor (114) zum Erfassen, ob das Papier (117) vorschriftsmäßig der Druckeinheit (120) zugeführt wird, und einen Papierausgabesensor (115) zum Erfassen, ob das in der Druckeinheit (120) bedruckte Papier (117) vorschriftsmäßig davon ausgegeben wird, wobei das Verfahren die folgenden Schritte umfaßt und durch sie **gekennzeichnet** ist:

- a) Anhalten des Betriebs der Abbildungseinheit, wenn ein Betriebsfehler auftritt;
- b) Wiederaufnehmen des Betriebs der Abbildungseinheit, wenn die Fehlerquelle innerhalb einer vorbestimmten Zeit beseitigt ist; und
- c) Betreiben des photoempfindlichen Bandes (104) und/oder der Transferwalze (109) und/oder der Fixierwalze (110) und/oder der Reinigungseinheit (105), wenn die Fehlerquelle nicht innerhalb der vorbestimmten Zeit beseitigt ist, um Ladungen und Toner, die auf dem photoempfindlichen Band (104) zurückgeblieben sind, zu entfernen.
2. Verfahren zum Steuern einer elektrographischen Abbildungseinheit nach Anspruch 1, bei dem, wenn der Fehler ein Papieraufnahmefehler ist, der von dem Papieraufnahmesensor (113) erfaßt wird, der Schritt c) die folgenden Unterschritte umfaßt:
- (c<sub>1</sub>) Trennen des photoempfindlichen Bandes (104) von der Transferwalze (109); und
- (c<sub>2</sub>) Entfernen von Ladungen und Toner, die auf dem photoempfindlichen Band (104) zurückgeblieben sind, durch Betreiben des photoempfindlichen Bandes (104) und der Reinigungseinheit (105).
3. Verfahren zum Steuern einer elektrographischen Abbildungseinheit nach Anspruch 1, bei dem, wenn der Fehler ein Papierzuführfehler ist, der von dem Papierzuführsensor (114) erfaßt wird, der Schritt c) die folgenden Unterschritte umfaßt:
- (c<sub>1</sub>') Trennen des photoempfindlichen Bandes (104) von der Transferwalze (109); und
- (C<sub>1</sub>') Entfernen von Ladungen und Toner, die auf dem photoempfindlichen Band (104) zurückgeblieben sind, durch Betreiben des photoempfindlichen Bandes (104) und der Reinigungseinheit (105).
4. Verfahren zum Steuern einer elektrographischen Abbildungseinheit nach Anspruch 3, weiterhin enthaltend den Schritt des Entfernens von Toner, der auf der Transferwalze (109) zurückgeblieben ist.
5. Verfahren zum Steuern einer elektrographischen Abbildungseinheit nach Anspruch 1, 2, 3 oder 4, weiterhin enthaltend den Schritt des Trennens der Transferwalze (109) von der Fixierwalze (110).
6. Verfahren zum Steuern einer elektrographischen Abbildungseinheit nach Anspruch 1, bei dem, wenn der Fehler ein Papierausgabefehler ist, der von dem Papierausgabesensor (105) erfaßt wird, der Schritt c) die folgenden Unterschritte umfaßt:
- (c<sub>1</sub>') Ermitteln, ob eine Übertragung von der Transferwalze (109) auf das Papier (117) stattfindet;
- (c<sub>2</sub>') Abwarten für einen Eingriff, wenn die Übertragung stattfindet; und
- (c<sub>3</sub>') Trennen des photoempfindlichen Bandes (104) von der Transferwalze (109), wenn die Übertragung nicht stattfindet, und Betreiben des photoempfindlichen Bandes (104) und der Reinigungseinheit (105).

## Revendications

1. Procédé pour commander un dispositif électrographique de formation d'image, comprenant une courroie photosensible (104), une unité d'impression (120) comportant un rouleau de transfert (39) pour transférer sur un papier (117) une image formée sur ladite courroie photosensible (104) et un rouleau de fixage (110) pour fixer l'image transférée sur ledit papier (117), une unité de nettoyage (105) pour retirer les charges et le toner restant sur ladite courroie photosensible (104), un détecteur (113) d'interception de papier servant à détecter si le papier (117) est normalement intercepté à la sortie d'une unité d'alimentation (111) de cassette de papier, un détecteur (114) d'alimentation en papier pour détecter si le papier (117) est normalement fourni à ladite unité d'impression (120) et un détecteur (115) de sortie de papier servant à détecter si le papier (117) imprimé dans ladite unité d'impression (120) sort normalement de celle-ci, ledit procédé comprenant et étant **caractérisé par** les étapes consistant à :
- (a) arrêter le fonctionnement dudit appareil de formation d'image lorsque se produit une erreur de fonctionnement ;
- (b) remettre en marche ledit appareil de formation d'image lorsque la cause de l'erreur est supprimée dans un délai prédéterminé; et
- (c) mettre en marche au moins un des éléments comprenant ladite courroie photosensible (104), ledit rouleau de transfert (109), ledit rouleau de fixage (110) et ladite unité de nettoyage (105) lorsque la cause de l'erreur n'est pas supprimée dans le délai prédéterminé, afin de retirer les charges et le toner qui restent sur la courroie photosensible (104).
2. Procédé pour commander un dispositif électrographique de formation d'image selon la revendication

1, dans lequel, lorsque ladite erreur est une erreur d'interception de papier détectée par ledit détecteur (113) d'interception de papier, ladite étape (c) comporte les étapes secondaires consistant à :

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(c<sub>1</sub>) séparer ladite courroie photosensible (104) dudit rouleau de transfert (109) ; et

(c<sub>2</sub>) retirer les charges et le toner qui restent sur ladite courroie photosensible (104) en mettant en marche ladite courroie photosensible (104) et ladite unité de nettoyage (105). 10

3. Procédé pour commander un dispositif électrographique de formation d'image selon la revendication 1, dans lequel, lorsque ladite erreur est une erreur d'alimentation en papier détectée par ledit détecteur (114) d'alimentation en papier, ladite étape (c) comporte les étapes secondaires consistant à :

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(c<sub>1</sub>') séparer ladite courroie photosensible (104) dudit rouleau de transfert (109) ; et  
(c<sub>2</sub>') retirer les charges et le toner qui restent sur ladite courroie photosensible (104) en mettant en marche ladite courroie photosensible (104) et ladite unité de nettoyage (105). 20 25

4. Procédé pour commander un dispositif électrographique de formation d'image selon la revendication 3, comprenant en outre l'étape consistant à retirer le toner qui reste sur ledit rouleau de transfert (109). 30

5. Procédé pour commander un dispositif électrographique de formation d'image selon la revendication 1, 2, 3 ou 4, comprenant en outre l'étape consistant à séparer ledit rouleau de transfert (109) dudit rouleau de fixage (110). 35

6. Procédé pour commander un dispositif électrographique de formation d'image selon la revendication 1, dans lequel, lorsque ladite erreur est une erreur de sortie de papier détectée par ledit détecteur (115) de sortie de papier, ladite étape (c) comprend les étapes secondaires consistant à :

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(c<sub>1</sub>") déterminer si un transfert est réalisé dudit rouleau de transfert (109) vers ledit papier (117); 45

(c<sub>2</sub>") attendre pendant une opération au cours du transfert ; et

(c<sub>3</sub>") séparer ladite courroie photosensible (104) dudit rouleau de transfert (109) en l'absence de transfert et mettre en marche ladite courroie photosensible (104) et ladite unité de nettoyage (105). 50

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FIG. 1

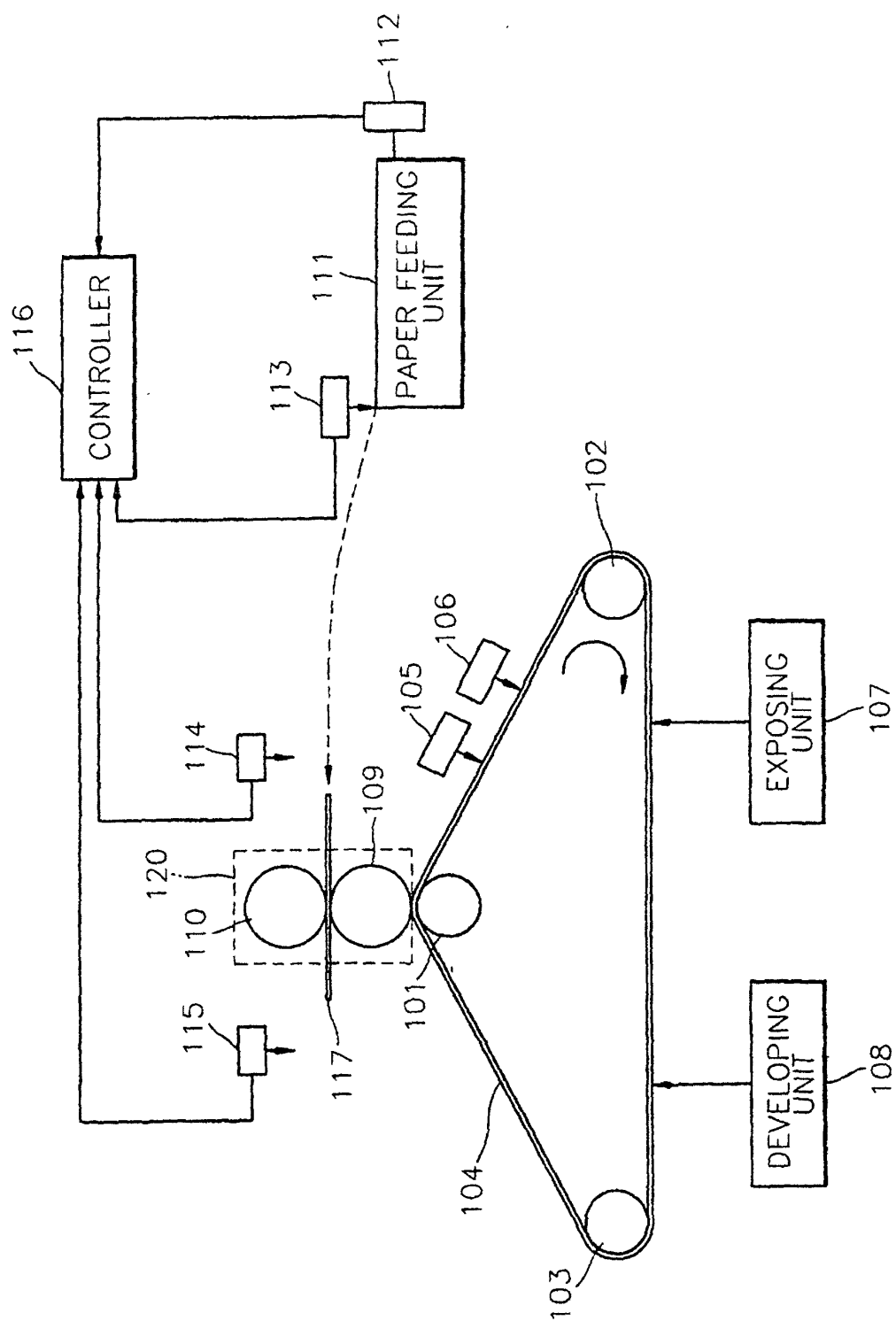


FIG. 2

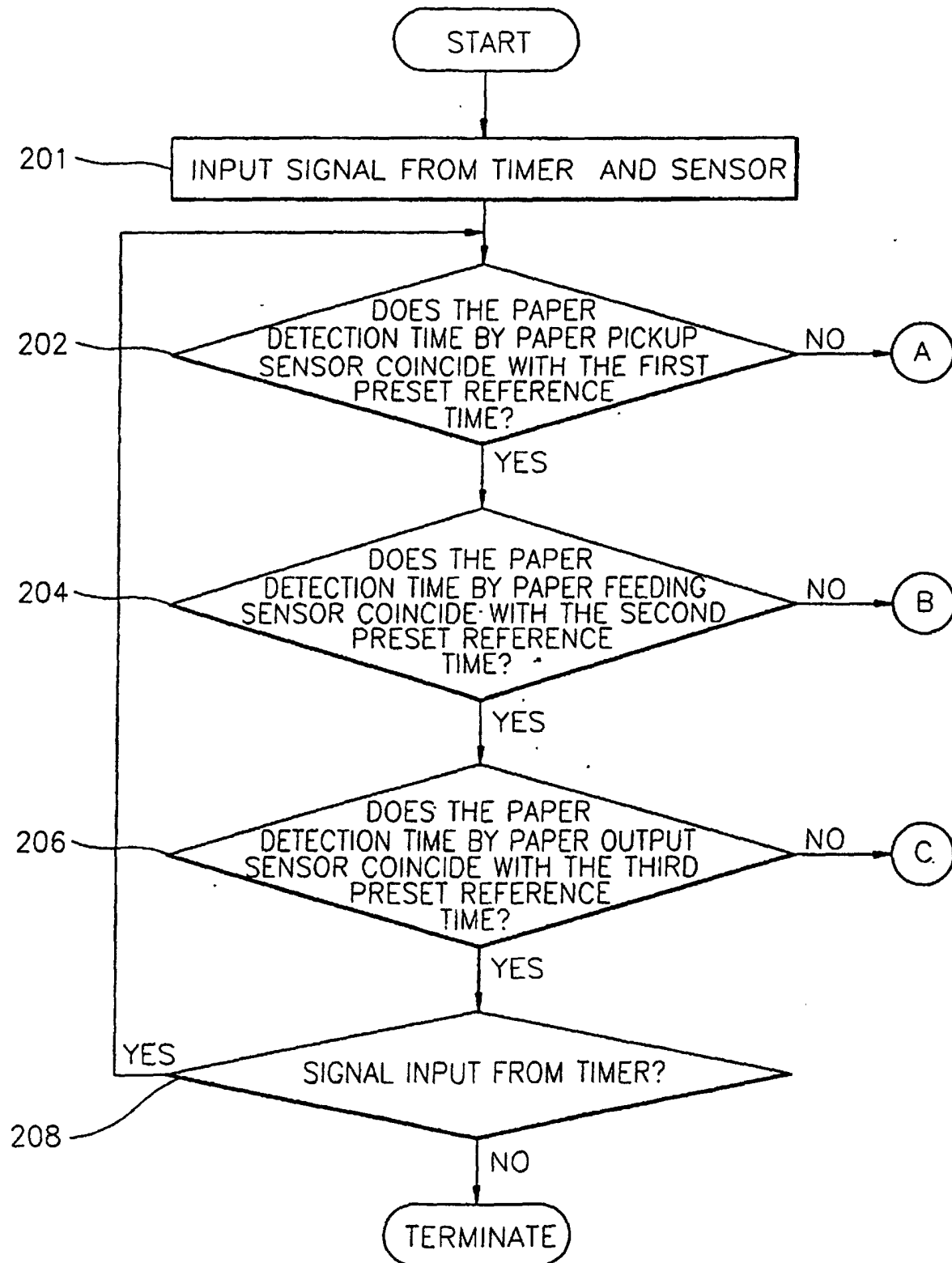


FIG. 3

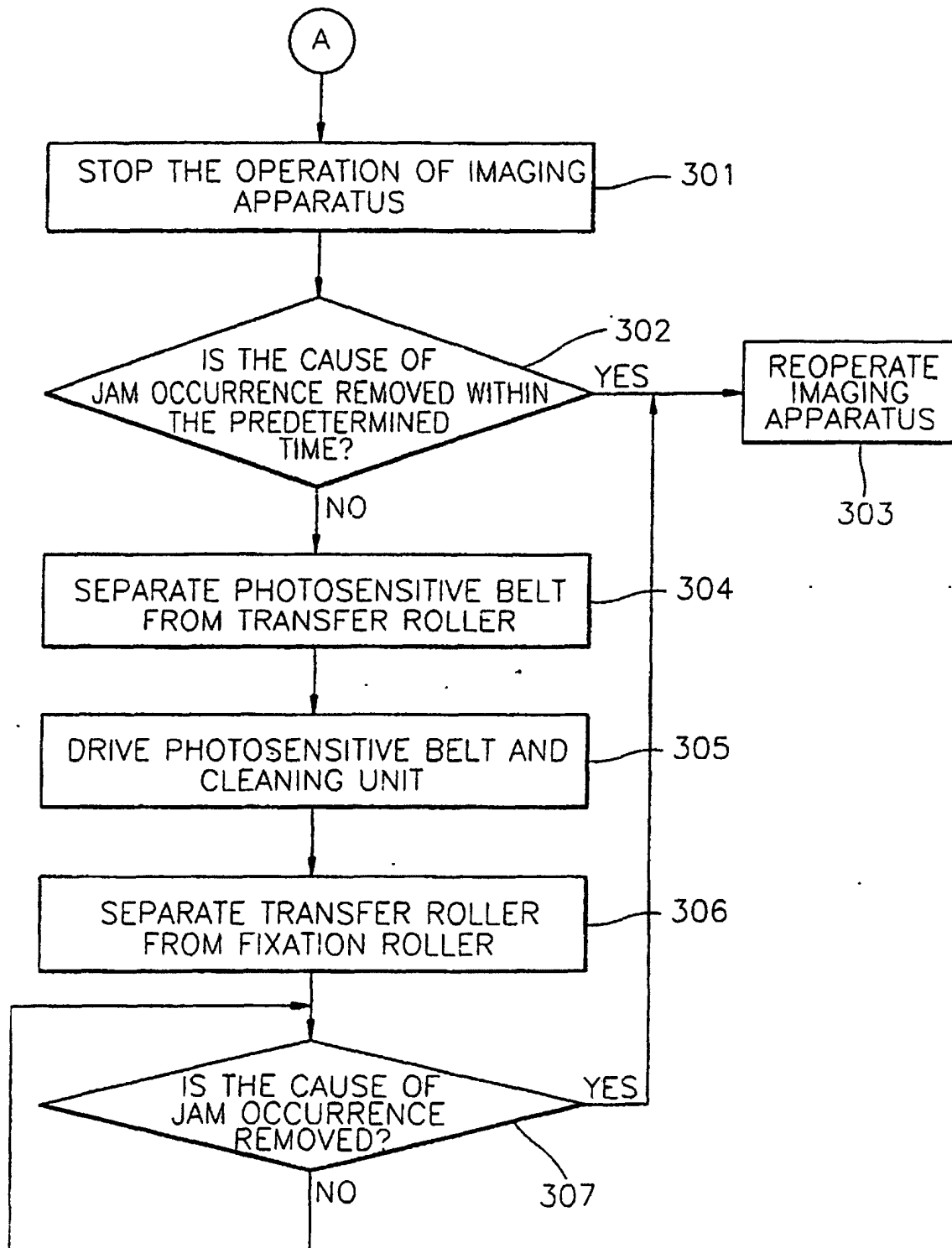


FIG. 4

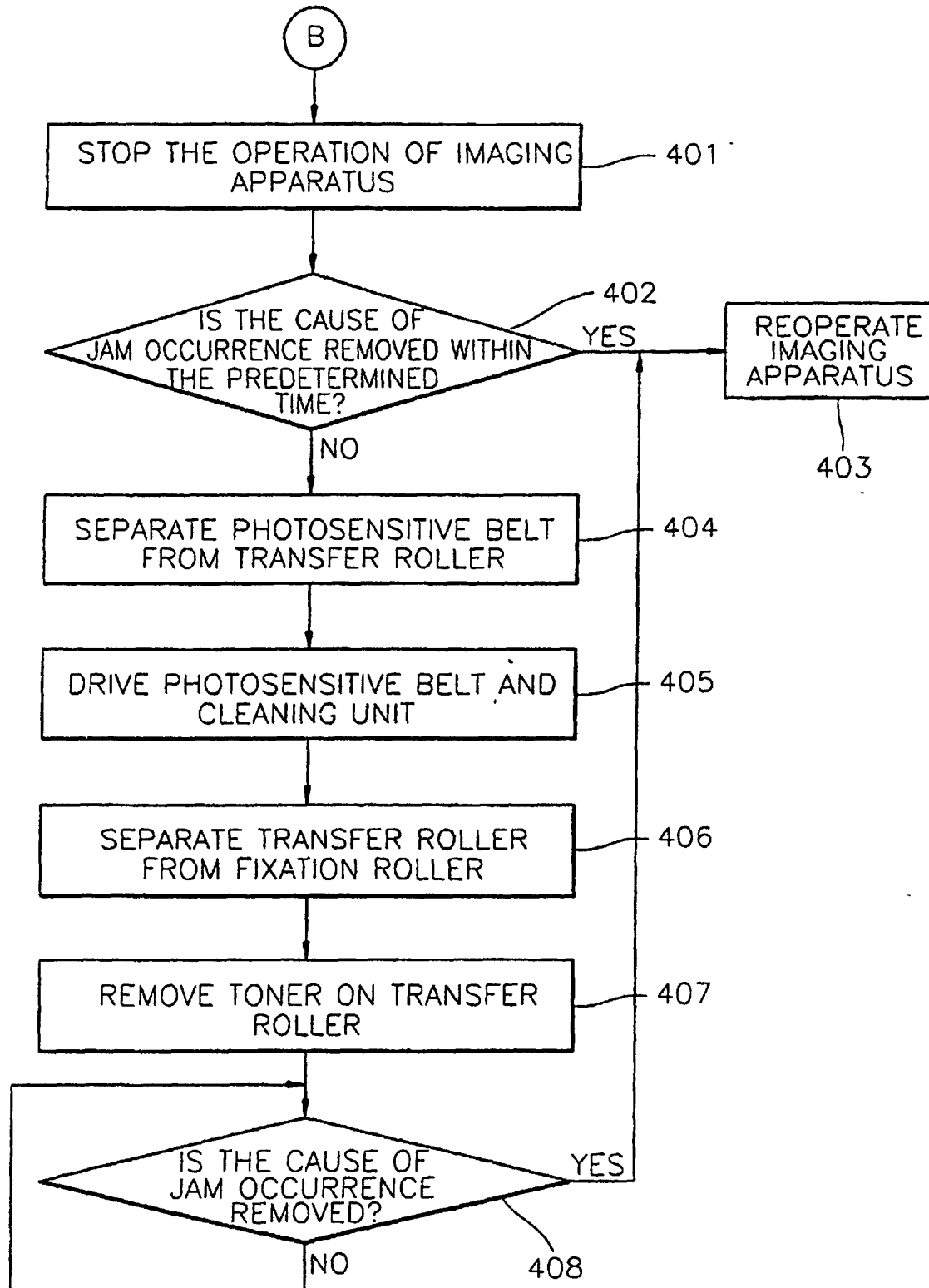


FIG. 5

